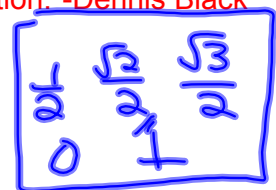


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"If you continue to look at the past, you're focusing on the wrong direction." -Dennis Black

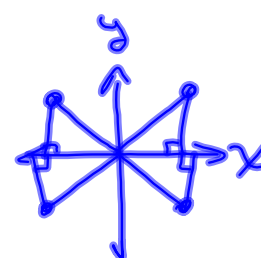
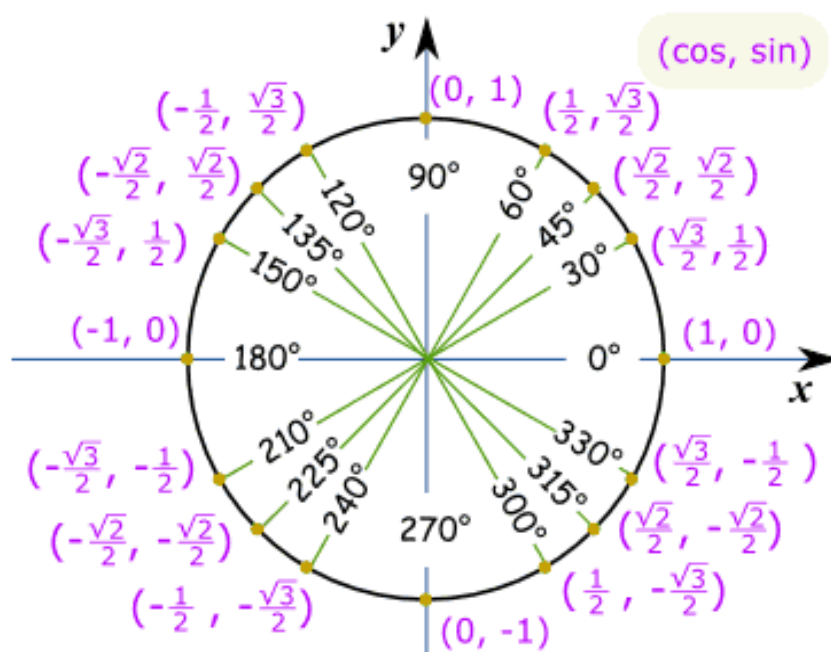
HW: "Reciprocal Trig Functions" homework section



AIM: What are other Trigonometric Functions?

Warm Up:

Fill in the Unit Circle with the angles and coordinates



THE OTHER FOUR TRIGONOMETRIC FUNCTIONS

1. SECANT: $\sec(\theta) = \frac{1}{\cos(\theta)}$

2. COSECANT: $\csc(\theta) = \frac{1}{\sin(\theta)}$

3. COTANGENT: $\cot(\theta) = \frac{1}{\tan(\theta)}$ or equivalently $\cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)}$

Exercise #1: Considering your work with sine and cosine, evaluate each of the following. Express your answers in exact and simplest form.

(a) $\sec(60^\circ)$

flip of cos
 $\cos 60 = \frac{1}{2}$

$\sec 60 = \frac{2}{1}$

$\boxed{2}$

(b) $\cot(150^\circ)$

Flip tan

$\tan 150 = -\frac{\sqrt{3}}{3}$

$\cot 150 = \frac{3}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$\cot 150 = \frac{3\sqrt{3}}{-3} = \boxed{-\sqrt{3}}$

(c) $\csc\left(\frac{3\pi}{4}\right) = \csc \frac{3(180)}{4}$

$\csc 135$

$\sin 135 = \frac{\sqrt{2}}{2}$

$\csc 135 = \frac{2}{\frac{\sqrt{2}}{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\csc 135 = \frac{2\sqrt{2}}{\cancel{2}}$

$\csc 135 = \boxed{\sqrt{2}}$

Exercise #2: Which of the following is closest to the value of $\sec(52^\circ)$?

(1) 0.62

(3) 0.36

(2) 1.62

(4) 2.48

$\frac{1}{\cos 52}$

Because each of these reciprocal trigonometric functions has a variable denominator, there will be angles at which these denominators are zero and hence the function is undefined.

Exercise #3: Which of the following values of x is not in the domain of $y = \csc(x)$?

(1) $x = 180^\circ$

(3) $x = 90^\circ$

(2) $x = 60^\circ$

(4) $x = 135^\circ$

x can't be

$\csc(x) = \frac{1}{\sin(x)}$

$\sin(x) \neq 0$

$\sin 180 = 0$

$\sin 60 = \frac{\sqrt{3}}{2}$

$\sin 90 = 1$

$\sin 135 = \frac{\sqrt{2}}{2}$

Because each of these functions is dependent on sine and/or cosine, it is possible to determine the **sign** (positive or negative nature) of each based on the quadrant of the input angle.

Exercise #4: Determine the sign of each of the following trigonometric functions in the quadrant specified.

(a) $\cot(\beta)$ for β in quad. II

(b) $\sec(\beta)$ for β in quad. IV

(c) $\csc(\beta)$ for β in quad. III

Negative

Positive

Negative

Exercise #5: If $\cot(\theta) < 0$ and $\sec(\theta) > 0$ then θ could be which of the following angles?

(1) $\theta = 48^\circ$ QI

(3) $\theta = 122^\circ$ QII

(2) $\theta = 310^\circ$

QIV

(4) $\theta = 225^\circ$ QIII

$\cot \theta < 0$ (negative)

II and IV

$\sec \theta > 0$ (positive)

I and IV

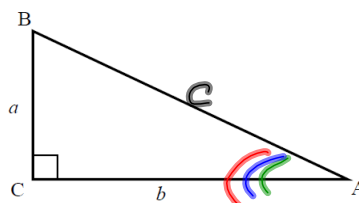
We should also be able to produce all of the trigonometric ratios (all SIX of them) if we are given a right triangle.

Exercise #6: A right triangle is shown below with sides of length a and b .

(a) Find the length of the hypotenuse in terms of a and b . Label on the diagram.

$$a^2 + b^2 = c^2$$

$$\sqrt{a^2 + b^2} = c$$



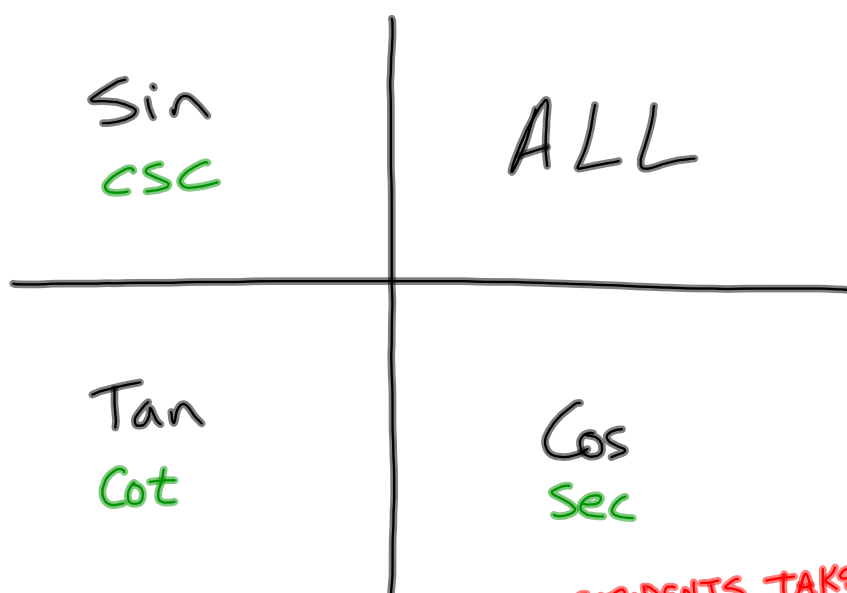
(b) State the value of each of the following trigonometric ratios in terms of the constants a and b .

$$\sin A = \frac{a}{c} \xrightarrow{\text{Flip}} \csc A = \frac{c}{a}$$

$$\cos A = \frac{b}{c} \quad \sec A = \frac{c}{b}$$

$$\tan A = \frac{a}{b} \quad \cot A = \frac{b}{a}$$

Exercise #7: If α is an angle whose terminal ray lies in the fourth quadrant and $\cos \alpha = \frac{1}{3}$, then determine the exact value of $\csc \alpha$. Show how you arrived at your answer.



ALL STUDENTS TAKE CALCULUS